

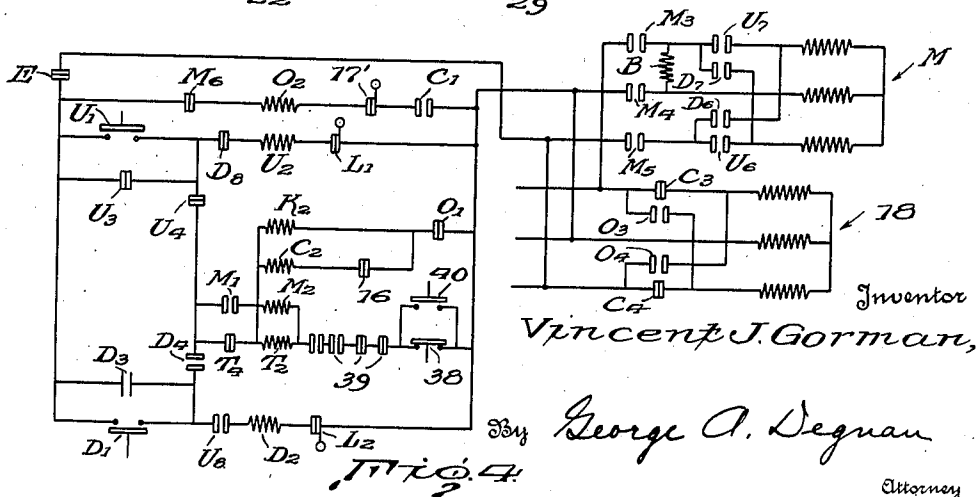
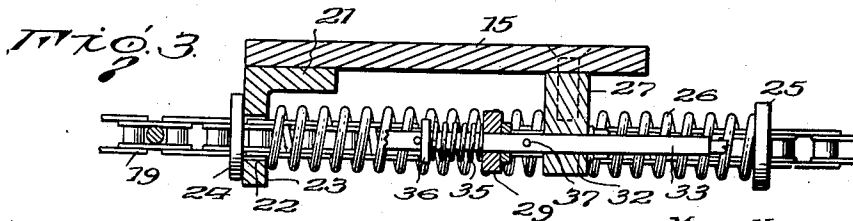
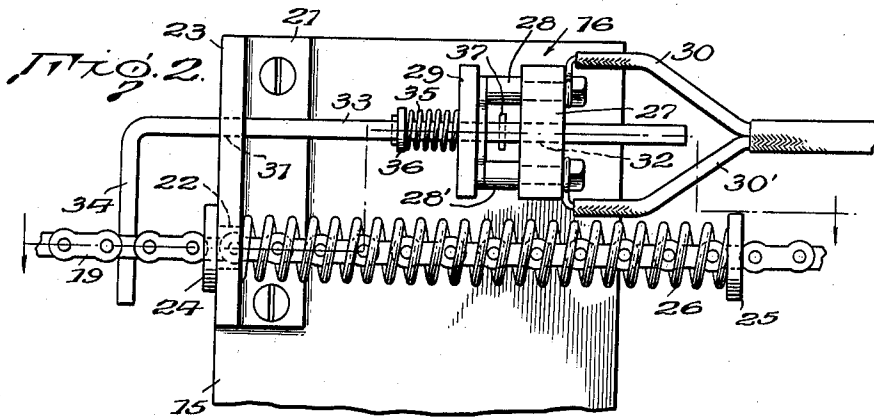
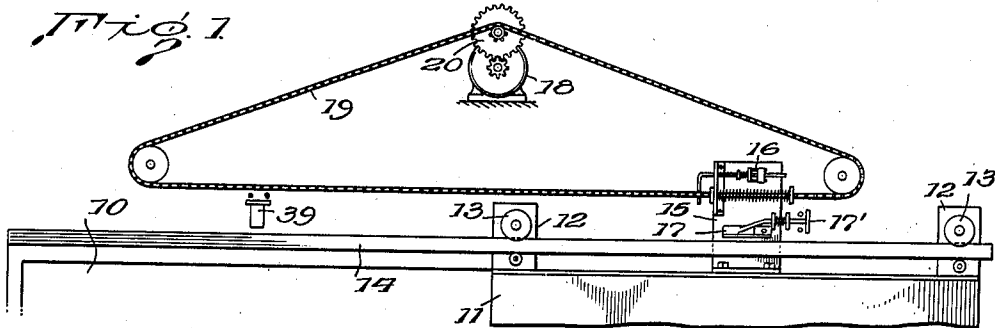
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DOOR OPERATING MECHANISM

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DOOR OPERATING MECHANISM

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The present invention relates to motor operated closure or door operators, and more particularly to switch mechanism associated with the door operating motor controls and which will open the motor circuit when movement of the door to closed position is resisted by a person or obstacle in the opening which the door is intended to close.

In some types of motor operated doors, particularly those employed in elevator and car entrances, it is desirable that means be provided to stop or reverse the closing movement of the door when a person is in the path of the door. Various mechanical movements have been designed to reverse the movement of the door under these conditions, but in previous efforts to provide safety means of this nature, the resulting mechanisms, while effective, have been complicated and expensive.

It is one of the objects of the present invention to provide a circuit opening switch controlling reversal for the motor of a closure operator which is simple in its construction and comprised of few and relatively inexpensive parts.

It is another object of the invention to provide a switch operating device of the character specified which is readily and easily associated with a chain attached to the door through a lost motion connection and driven by an electric motor.

Other objects will be apparent from the following description of the invention taken in connection with the accompanying drawing, in which:

Fig. 1 is a fragmentary front elevation of an entrance and door therefor, together with a motor and a switch adapted to open when movement of the door to closed position is resisted;

Fig. 2 is an enlarged front view of the switch shown in Fig. 1;

Fig. 3 is a section taken on line 3—3 of Fig. 2; and

Fig. 4 is a schematic wiring diagram of the circuits for the elevator and door operating motors.

Referring to the drawing, the opening to an elevator or other entrance is indicated at 10. This entrance is adapted to be closed by a horizontally slidable door 11 having brackets 12 thereon accommodating rollers 13 cooperating with track 14 in the usual manner. Secured to the door by any suitable means substantially intermediate the rollers 13 is a plate 15 which supports the safety switch 16 and the usual door contact switch cam 17. This cam is also adapted to open the door opening limit switch 17.

Above the door is a motor 18 which drives chain 19 through gear reduction mechanism 20, chain 19 having a lost motion connection with plate 15 as will be presently explained.

Secured to plate 15 is an angle piece or guide member 21 having an opening 22 in the side flange 23 thereof through which chain 19 is free to pass. As will be seen in Fig. 2, a pair of spaced discs or washers 24, 25 are fastened to the chain. Disc 24 normally abuts one side of flange 23 and during the door opening operation forms a connection between the chain and plate 15. Surrounding a portion of the chain is a spring 26, one end of which bears against the other side of flange 23, the other end of the spring abutting disc 25. Normally this spring is under compression, so that the movement of the chain to close the door is transmitted from disc 25 through the spring to plate 15. It will be observed, however, that if sufficient resistance is imposed on the door to prevent its closing, the chain and disc 25 will continue to move in the same direction, spring 26 being further compressed.

Switch 16 comprises a fixed insulated bracket 25 supporting a pair of contacts 28, 28' thereon and bridge member 29. The contacts are connected to terminals 30, 30' of a wire conductor forming part of the motor control circuit. Guided in openings 31, 32, in flange 23 and bracket 27 respectively, is a switch operating bar 33, one end 34 of which is bent angularly to engage chain 19 as shown in Fig. 2. Bridge member 29 is slidably mounted on bar 33, but is normally urged into engaging relation with contacts 28, 28' by spring 35, the ends of which bear respectively against the bridge member and washer 36 fast on the bar. Also fixed to bar 33 is a pin 37 adapted to engage the bridge member upon movement of the bar with respect to the bracket 27 in the direction of door closing. When pin 37 moves sufficiently far to the left in Fig. 2, it will overcome the resistance of spring 35 to open switch 16. This will occur when movement of the door is resisted, bar 33 continuing to move with chain 19. As soon as the switch is opened, the motor circuit is reversed, as will be explained hereinafter.

Referring to the wiring diagram in Fig. 4, it will be assumed that the "up" button switch U₁ has been momentarily closed, energizing relay U₂ to close switches U₃, U₄. The latter switches are on one end of a pivoted switch arm, on the other end of which is a switch U₅, the latter being normally closed when switches U₃ and U₄

at the opposite end of the switch arm are open. When the switch U₁ is closed, the door is open and at least one of the door-operated safety switches 39 is open, relay M₂ being thus deenergized.

Relay M₂ when energized closes switches M₁, M₃, M₄, M₅, controlling operation of the elevator motor M. Hence, when relay M₂ is deenergized, the motor cannot be operated.

Relay T₂ is deenergized at the same time relay M₂ is deenergized. Relay T₂ when energized opens a time or delay switch T₄, the latter being normally closed when relay T₂ is deenergized. With switch T₄ closed, relay C₂ is energized to close switches C₃, C₄ and open switch C₁. The reversible motor then moves the door to closing position.

When the door is fully closed, all of the switches 39 will be closed, whereupon relays M₂, T₂ will be energized and the motor switches M₁, M₃, M₄, M₅ closed. When the door is fully closed, the resistance of the door frame will open switch 16, and, since relay C₂ is in series with this switch, the door closing circuit of motor 18 will be opened. Switches U₆, U₇ being closed by relay U₂, the elevator will ascend until automatic switch 38, responsive to the next landing position of the elevator, is opened. The motor switches are then opened and switch M₅ closed. Since switches C₁ and 17' are also closed, relay O₂ will be energized to close switches O₃, O₄ and operate motor 13 in a direction to open the door. The door will continue to open until limit switch 17' opens. Switch O₁ is open when the switches U₃, U₄ are closed, so that door closing relay C₂ is inoperative during door opening operation.

It is apparent that operation of the elevator in a downward direction is controlled in a similar manner by the "down" switches designated generally by the letter D.

Assuming that while the door is closing a person or obstacle is in the path of the door, chain 19 and bar 33 will obviously continue to move in the direction of door closing. Switch 16 will then open, deenergizing relay C₂ and opening switches C₃, C₄. At the same time, switch C₁ closes and, since switches M₅ and 17' are already closed, relay O₂ will be energized to close the switches of the door opening circuit. The door continues to open until switch 17' opens. This is followed by deenergizing of relay O₂, opening switches O₃, O₄, and closing switch O₁. Relay C₂ is then energized and the door closing circuit closed.

In addition to the relays and switches referred to hereinbefore, the circuits are provided with the

usual emergency switch E, pass button 40, which may be closed to permit the car to pass a landing, upper and lower limit switches L₁ and L₂ at the top and bottom of the elevator well, brake operating relay B, and a cam retiring relay K₂, the latter operating a safety landing door locking device when the car is in operation. It is intended that the car door and landing doors be connected by suitable devices to permit the doors to be simultaneously opened by the motor 18.

While a preferred form of apparatus is shown and described, it is not intended that the invention be limited to the exact details illustrated. The construction may be modified within the terms of the appended claims.

What I claim as my invention is:

1. In an apparatus for closing an elevator door, an electric motor, a flexible member driven by said motor and adapted to move said door to closed position, spring means interposed between said flexible member and said door to permit movement of the flexible member with respect to the door, contact means connected to and movable with said flexible member, and other contact means fixed to said door and engageable with said first mentioned contact means, said spring means normally urging said first-mentioned contact means into engagement with said other contact means, said contact means comprising a switch adapted to control the operation of said motor and being movable away from each other to open the switch when closing movement of the door is resisted.

2. In an apparatus for closing an elevator door, an electric motor, a flexible member driven by said motor and adapted to move said door to closed position, spring means interposed between said flexible member and said door to permit movement of the flexible member with respect to the door, a bar connected to and movable with said chain, contact means slidably mounted on said bar, other contact means fixed to said door and engageable with said first mentioned contact means, said first mentioned and said other contact means comprising a switch adapted to control the operation of said motor, yieldable means interposed between said first mentioned contact means and said bar normally tending to urge the first mentioned contact means into engagement with said other contact means, and means on said bar for separating said contact means to open the switch when closing movement of the door is resisted.